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09/782,494	02/13/2001	Stephen L. Buchwalter	YOR920000745US1(14029)	9921

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EXAMINER

NGUYEN, KHIEM D

ART UNIT PAPER NUMBER

2823

DATE MAILED: 09/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/782,494

Applicant(s)

BUCHWALTER ET AL.

Examiner

Khiem D Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 03 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) 23-32 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 21 and 22 is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 February 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Response to Amendment***

***Response to Arguments***

Applicant's arguments filed 07-03-2003 have been fully considered but they are not persuasive.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gilleo et al. (U.S. Patent 6,228,678) in view of Coyle (U.S. Pub. 2002/0105092).

Gilleo discloses a method of forming a microelectronic interconnect structure containing a bilayer underfill layer comprising the steps of (See FIGS. 1-5 and related text):

(a) forming a first polymeric material (FIG. 1, 14) composed of epoxies has a thickness of from about 25 to about 100 microns by a deposition process such as spin coating on a surface of a semiconductor wafer (FIG. 1, 12) having interconnect pads (FIG. 1, 15) disposed thereon and said wafer has one or more devices present therein and the first polymeric material further includes an inorganic filler comprises of silica wherein said inorganic filler is present in said first polymeric material in an amount of from about 10-80 % by weight (col. 5, lines 11-37);

(b) patterning said first polymeric material to provide openings (FIG. 2, 16) that expose said interconnect pads by etching (col. 9, lines 7-17);

(c) forming conductive bump material (FIG. 3, 18) such as solder bumps in said openings by a plating method (col. 9, lines 18-23);

(d) forming a second polymeric material (FIG. 4, 20) composed of flux material over said first polymeric material and said conductive bump material wherein the second polymeric material has a thickness that is thinner than the first polymeric material (col. 9, lines 24-33);

(e) dicing said semiconductor wafer into individual chips (col. 6, lines 53-61); and

(f) bonding at least one of said individual chips to an external substrate such as circuit board or chip carrier, wherein during said bonding said conductive bump material penetrates said second polymeric material and contacts a surface of said external substrate (col. 6, lines 53-61);

Gilleo teaches the first polymeric material is formed by spin coating but fails to explicitly teach that the second polymeric material is formed by spin coating as recited in present claim 14. However, it would have been obvious to one of ordinary skill in the art of making semiconductor devices to apply Gilleo's teaching to form the second polymeric material by spin coating because doing so can provide a smooth and level coating (col. 5, lines 11-15).

Gilleo teaches that the first polymeric material is a thermoplastic but fails to explicitly teach the second polymeric material is a thermoplastic as recited in present claim 16. However, it would have been obvious to one of ordinary skill in the art of

making semiconductor devices to apply Gilleo's teaching to form the second polymeric material such that the second polymeric material is a thermoplastic because doing so can eliminate the problems associated with thermoset underfills (col. 7, lines 29-32).

Gilleo fails to teach the ranges for the thickness of the second polymeric material and the temperature and time duration of the bonding step as recited in present claims 18-19.

However, it would have been obvious to one of ordinary skill in the art of making semiconductor devices to determine the workable or optimal ranges for the thickness of the second polymeric material and the temperature and time duration of the bonding step through routine experimentation and optimization to obtain optimal or desired device performance because the thickness of the second polymeric material and the temperature and time duration of the bonding step are result-effective variables and there is no evidence indicating that the thickness of the second polymeric material and the temperature and time duration of the bonding step are critical and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP§2144.05. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is aid to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

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Gilleo discloses forming a second polymeric material composed of flux material atop the first polymeric material and the conductive bump material but fails to teach partially cured to a B-stage state the second polymeric material as recited in present claim 1.

Coyle discloses forming a second polymeric material 58 that is partially cured to a B-stage state atop the first polymeric material 54 and the conductive bump material 51 (page 3, paragraphs [0045]-[0046] and FIGS. 5a-c). It would have been obvious to one of ordinary skill in the art of making semiconductor devices to combine the teaching of Gilleo and Coyle to enable the second polymeric material of Gilleo to be formed and furthermore to obtain a high performance, high speed, low inductance package (page 1, paragraph [0011]).

***Allowable Subject Matter***

Claims 21-22 are allowed.

***Response to Applicant's Arguments***

Applicant's arguments filed 07-03-2003 have been fully considered but they are not persuasive.

In response to Applicant's argument that the applied references Gilleo et al. (U.S. Patent 6,228,678) and Coyle (U.S. Pub. 2002/0105092) fail to teach or suggest forming a second polymeric material that is partially cured to a B-stage state atop the first polymeric material and the conductive bump material as recited in amended claim 1, examiner disagree, Gilleo discloses forming a second polymeric material (FIG. 4, 20) composed of flux material atop the first polymeric material (FIG. 4, 14) and the

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conductive bump material (FIG. 4, 18) (col. 9, lines 24-33) but fails to explicitly disclose partially cured to a B-stage state the second polymeric material, Coyle discloses forming a second polymeric material 58 that is partially cured to a B-stage state atop the first polymeric material 54 and the conductive bump material 51 (page 3, paragraphs [0045]-[0046] and FIGS. 5a-c). It would have been obvious to one of ordinary skill in the art of making semiconductor devices to combine the teaching of Gilleo and Coyle to enable the second polymeric material of Gilleo to be formed and furthermore to obtain a high performance, high speed, low inductance package (page 1, paragraph [0011]).

As a rule, obviousness is based upon what the “references taken collectively would suggest to those of ordinary skill in the art.” *In re Rosselet*, 146 USPQ 183, 186 (CCPA 1965). Furthermore, one cannot show non-obviousness by merely attacking references individually where the rejections are based on combinations of references. *In re Keller*, 208 USPQ 871 (CCPA 1981); *In re Merck & Co., Inc.*, 231 USPQ 375 (Fed. Cir. 1986). Instead, there must be an absence of “some teaching, suggestion or incentive supporting the prior art combination that produces the claimed invention.” *In re Bond*, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990). “Just as piecemeal reconstruction of the prior art by selecting teachings in light of [the] disclosure is contrary to the requirements of 35 USC § 103, so is the failure to consider as a whole the references collectively as well as individually.” *In re Passal*, 165 USPQ 720, 723 (CCPA 1970). For these reasons, the rejection is considered proper.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D Nguyen whose telephone number is (703) 306-0210. The examiner can normally be reached on Monday-Friday (8:00 AM - 5:00 PM).


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-9179 for regular communications and (703) 746-9179 for After Final communications.



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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

K.N.  
September 17, 2003

  
Olik Chaudhuri  
Supervisory Patent Examiner  
Technology Center 2800